



Annual review of the Faculty of Science

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Foreword

In 2015, the academic community made itself heard in many ways, not only on the topic of research and education, but also on administrative style and staff involvement. I am proud of the constructive contribution made by Faculty of Science students and staff, who continued to look beyond their own field or faculty. The many results we have achieved also bear witness to their efforts.

Like the launch of QUVA Lab, where scientists and computing science company Qualcomm join forces. And Amsterdam scientists now have a new showcase for scientific developments: the Amsterdam Science magazine. As for education, six programmes have announced they will offer joint degrees in collaboration with VU Amsterdam. Partnerships with science faculties took more concrete form over the last year and within the domains Physics and Astronomy, Informatics and Earth, Ecology and Environment there are plans to transition into partnership institutes. Last but not least, our very 'own' chemistry lecturer Bas de Bruin was named best UvA lecturer of 2015.

As a team and individually, we worked to produce outstanding education and research. This annual report presents a few highlights. Unfortunately, it was not possible to mention every achievement, so to everyone who contributed, I would like to take this opportunity to express my deepest thanks. You have helped put science on the map in this city.



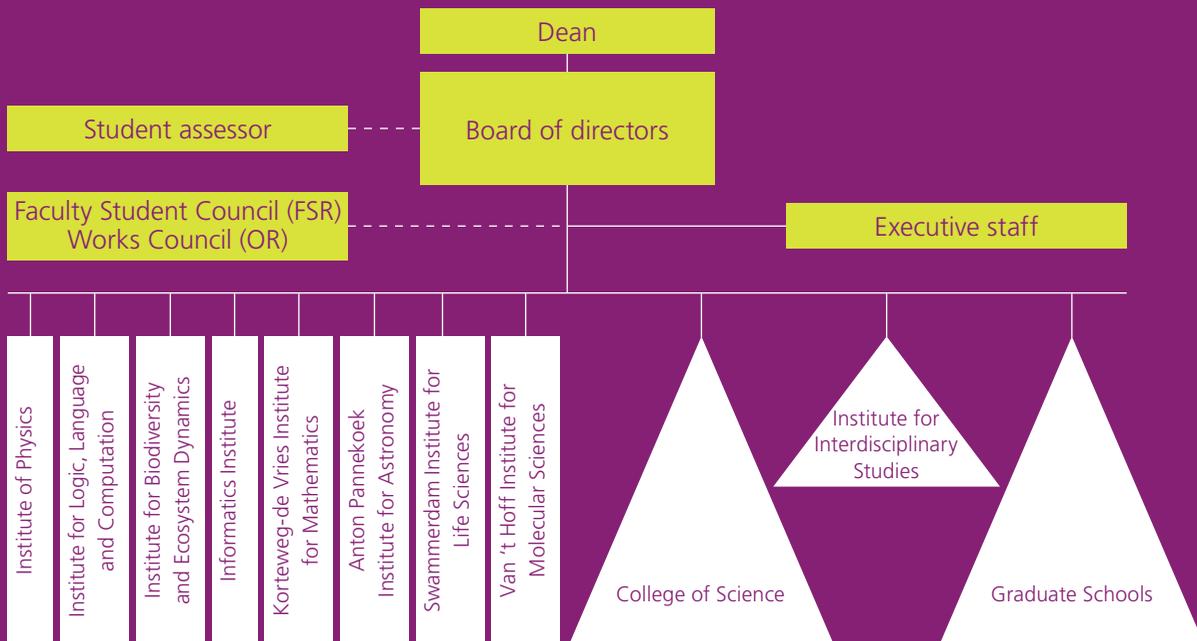
Prof. Karen Maex
*Dean of the Faculty of Science
University of Amsterdam*





The 2015 Faculty Board

Left to right: **Maaïke Lürsen** is director of operations, responsible for the staffing policy, ICT, accommodation, and occupational health, safety and environment portfolios. **Peter van Tienderen** is vice-dean and portfolio holder for research and innovation. He is also responsible for PhD student policy. He is the first replacement for the dean. **Karen Maex** is dean and president of the Faculty's board of directors. **Rudi Rust** is director of finance, responsible for the planning and control, market development and project support portfolios. **Michel Haring** director of education until January 2016, responsible for the courses offered and the organisation and quality of the teaching.



Students and lecturers at the Faculty of Science



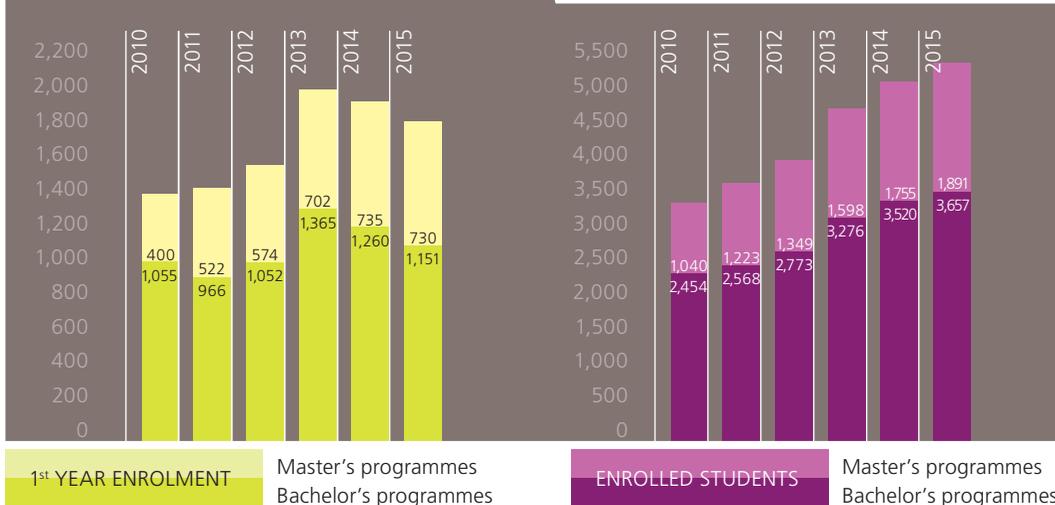
In 2015, six programmes (two Bachelor's and four Master's) at the science faculties of VU Amsterdam and the University of Amsterdam received accreditation for a joint degree by the Accreditation Organisation of the Netherlands and Flanders (NVAO): students enrolling in one of these programmes from September 2016 onwards will be

registered at both VU and UvA and upon completion will receive one degree from both universities: a joint degree.

Several students from the Faculty were successful in 2015 at different competitions: first prize in UvA Thesis Prize, nine medals at the International Mathematics Competition, fourth in

the Data Science Game and a winner of the SURF Innovation Challenge Award. Furthermore, four students received an Incentive prize by de KHMW and a Master's student Physics was elected to join the National Think Tank. The Faculty is also proud to have the UvA Lecturer of the Year 2015: chemist Bas de Bruin.

STUDENT ENROLMENT



Students learn first-hand about the most recent research developments and experience the expertise and passion with which lecturers practise their discipline.

Lecturer of the Year Award

During the 384th Dies Natalis of the UvA, Bas de Bruin was named Lecturer of the Year 2015 by the Student Council and the ASVA Student Union. De Bruin is Professor of Bio-Inspired Sustainable Catalysis at the Faculty of Science.

UvA Thesis Prize 2015

Roosmarijn Goldbach, who graduated from the Master's programme Logic, won the prize for best thesis in the UvA thesis prize competition 2015. Runner up was Jurn Heinen, who obtained his Master's degree in Chemistry.

Ranking science programmes in National Student Survey 2015

The UvA Master's programmes Physics, Astronomy and Astrophysics, System and Network Engineering and the Bachelor's Mathematics are listed in the top 10 of best rated university programmes in the field Science and Informatics. Furthermore, the satisfaction of UvA students about their programmes has increased. This is some of the results of the National Student Survey 2015.

Study associations in 2015

The Faculty's seven study associations provide a warm welcome to new students, support them during their studies and organise additional educational activities. Most of all, however, they see to it that thousands of students enjoy their time at university.

VIA *Information Science* / $\pm 1,500$ members / In 2015, VIA attracted international attention with their conference Awesome IT. They professionalised and organised additional lessons. Next to this, many nice activities were organised, such as a study trip to Edinburgh.

CONGO *Biology, Biomedical Sciences and Psychobiology* / $\pm 2,200$ members / In 2015 CONGO organised two parent visiting days for Biology and Biomedical Sciences and for Neurosciences to give an accurate reflection of the everyday life of the students on Science Park, including a lecture and practical.

Cognito *Brain and Cognitive Sciences* / ± 150 members / In 2015 Cognito organised its first symposium with the theme 'guilty pleasures'. This symposium was an opportunity to bring their students in contact with several interesting topics and researchers within their study field of interest.

NSA *Physics, Astronomy and Mathematics* / 1,050 members / The annual NSA symposium was themed 'The Inevitable' with, amongst others astronomer Vincent Icke. They also organised a study trip to Vienna.

ACD *Chemistry* / 351 members / In 2015, ACD organised a wide range of excursions and lectures on various topics, including 'A Fresh Look on Climate Change'. Fifty members went on a study trip to Berlin and the ACD celebrated its 70th birthday with a week full of activities.

Spectrum *Natural and Social Sciences and Future Planet Studies* / 789 members / Spectrum has gained not only a lot of very enthusiastic first-years, they also welcomed several new committees focussing, amongst other things, on education and democracy. Furthermore, Spectrum is looking forward to celebrate its 20th anniversary in 2016.

GAOS *Earth Sciences and Physical Geography* / 75 members / GAOS organized a trip to Poland in 2015. During this trip, members learned about the culture, nature and geological characteristics of the country. In addition, GAOS started organising informal events for both teachers and students to increase the communication between staff and students.

Faculty of Science Bachelor's programmes

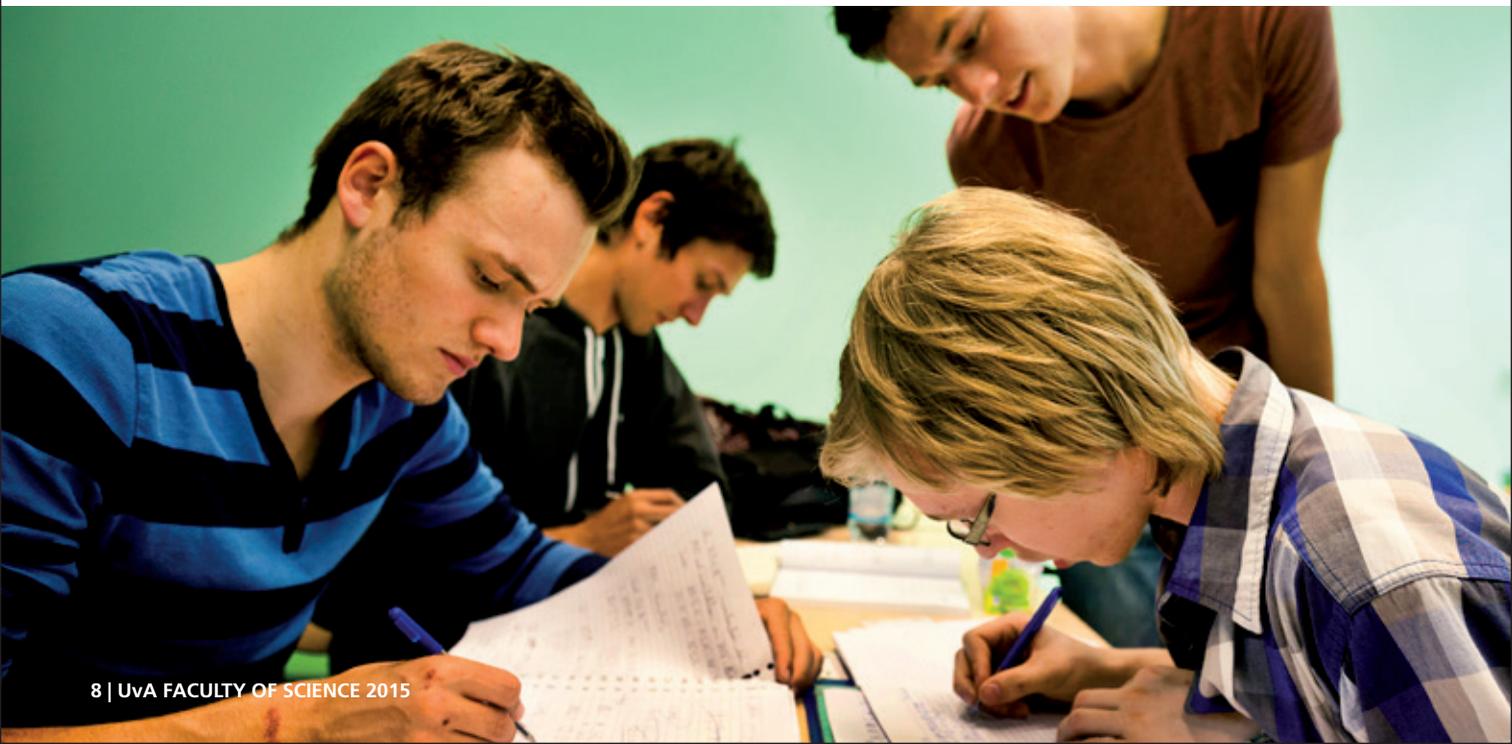
Over 2,600 students were enrolled in the Bachelor's degree programmes at the College of Science, which span the entire science spectrum. In addition, nearly 1,000 students were enrolled in programmes at the Institute for Interdisciplinary Studies (IIS).

Mathematics Bachelor's named 'Top Programme' by Study Guide

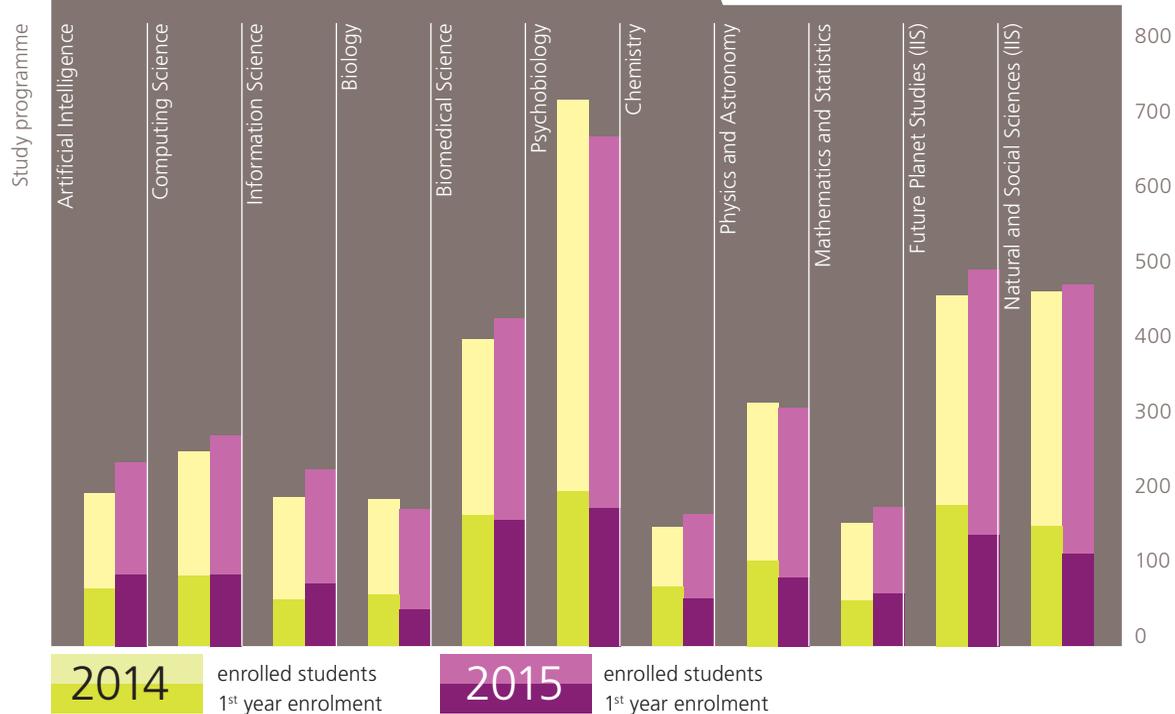
The Universities Study Guide (Keuzegids Universiteiten) awarded the UvA Bachelor's programme Mathematics its so-called 'Top Programme' honour. The Guide is of the opinion that: 'Almost all universities offer decent mathematics programmes, but those in Amsterdam and Groningen are the best.' Mathematics programmes achieve for the third year in a row high satisfaction rates regarding the amount of contact hours in teaching. Based on content as well, almost all mathematics programmes score (highly) above average.

Incentive Prize for four first-year students

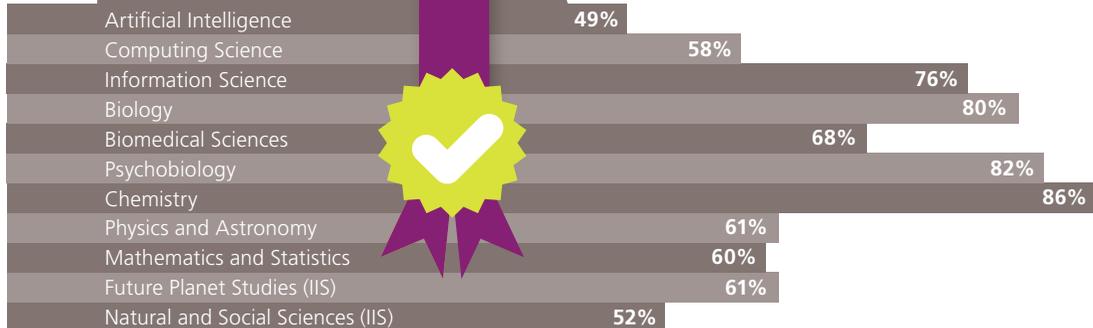
On 30 November, four excellent UvA students in exact and technical degree programmes received an Incentive Prize worth €500 from the Royal Holland Society of Sciences and Humanities. The winners are: Bastiaan Cnossen (mathematics and technical mathematics), Tim Henke (physics and technical physics, UvA and VU), Daniël Louwring (informatics and technical informatics) en Tim Daas (chemistry). These first-year students achieved the highest average grade in their class in their degree programmes at the University of Amsterdam.



STUDENT ENROLMENT



GRADUATION RATES

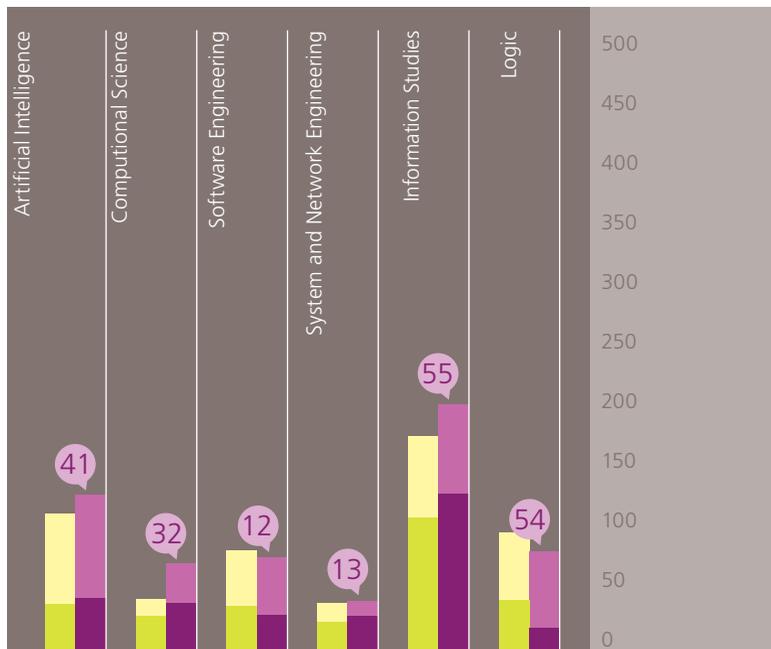


Graduation within four years.
Degree programme commenced in
September 2011. Small cohorts may
cause graduation rates to fluctuate.

Faculty of Science Master's programmes

In 2015, nearly 1,700 students were enrolled in the Master's programmes based at three Faculty of Science graduate schools: Informatics, Science and Life & Earth Sciences. A further 200 students were enrolled in Master's programmes at the Institute for Interdisciplinary Studies (IIS).

Study programme



Three UvA Informatics Master's receive 'Top Programme' designation

The Master's programmes in Logic, System and Network Engineering (SNE) and Software Engineering at the Graduate School of Informatics have all been designated as 'Top Programme' by the Universities Study Guide 2015. The SNE and Logic programmes have furthermore been ranked in the 'Top 20 Master's programmes' nationwide.

Game Studies students demonstrate applied games for care institute Cordaan

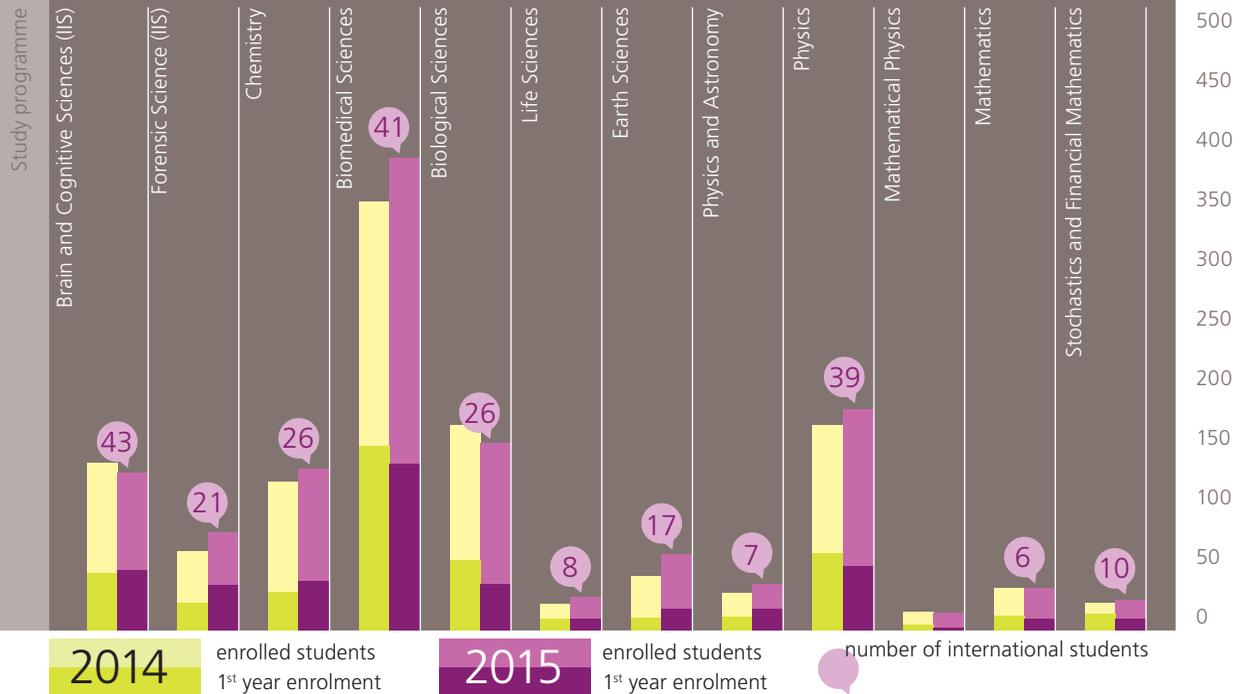
Students of the interdisciplinary Game Studies Master's programme demonstrated their prototypes of applied games for reducing social isolation in a project for the elderly residents of care centre Cordaan.

Master's students develop plan for floating islands

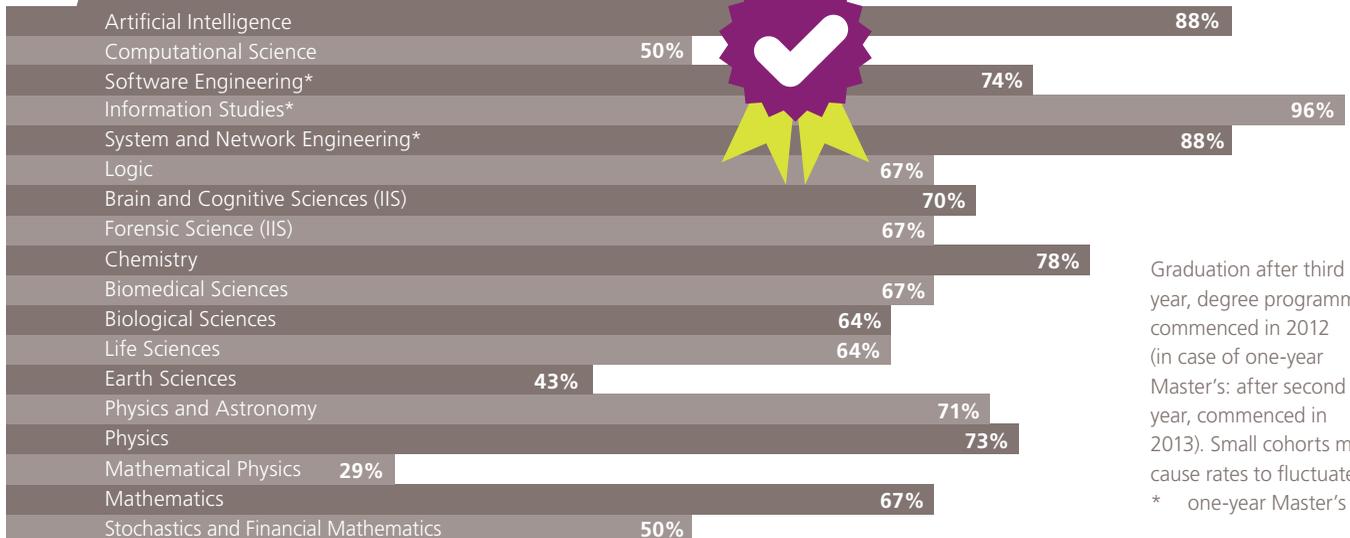
Master's students Alje van Dam, Daan Mes and Noortje Grijsels have developed a plan for the deployment of floating islands to improve the ecological quality of the Amsterdam harbour. The floating island modules can be adopted by citizens as a collective investment. The students were asked by the Port of Amsterdam to develop this project as part of the Tesla minor.



STUDENT ENROLMENT



GRADUATION RATES



Graduation after third year, degree programme commenced in 2012 (in case of one-year Master's: after second year, commenced in 2013). Small cohorts may cause rates to fluctuate.

* one-year Master's

Institute for Interdisciplinary Studies



FIGURES

IIS

Staff	FTEs
Teachers IIS	18
External teachers	7
Support and management	20
External support	9

Students	Programme	2014-2015
Bachelor	Future Planet Studies	491
Bachelor	Natural and Social Sciences	469
Master	Brain and Cognitive Sciences	133
Master	Forensic Science	78
Electives	Minor / Honours / Public	2,859

HIGH-LIGHTS



The Institute for Interdisciplinary Studies (IIS) is UvA's institute for interdisciplinary learning and teaching and develops new courses and programmes in collaboration with the faculties. IIS has more than 15 years' experience in interdisciplinary education and continuously develops substantive education innovations with an interdisciplinary character. The institute identifies new themes and issues linked to current developments in academia and society.

Over 1,100 students study full-time at IIS. IIS offers Bachelor's programmes in Natural and Social Sciences and in Future Planet Studies, a Master's in Forensic Science and a Research Master's in Brain and Cognitive Sciences. It also offers electives (minors, Honours modules and various public activities) for around 2,500 students. All its activities are interdisciplinary in nature and designed in collaboration with one or more faculties.

Developing interdisciplinary education

With a pivotal role in experiments, publications, manuals and interdisciplinary education methods, IIS plays a key role in implementation and innovation. The institute organises workshops on designing and bolstering interdisciplinary programmes for programme directors and lecturers and advises on various innovation programmes, amongst other things.

Publications

Under the name 'Perspectives on interdisciplinarity', IIS annually brings out a number of publications in collaboration with Amsterdam University Press. The past year a handbook on interdisciplinary skills was published, and the book 'Interdisciplinary research' is due to be published in 2016.

Game Studies

Together with Information Studies, IIS developed the Master's track Game Studies. In this programme, students are trained to translate client requirements into innovative game concepts in which scientific insights and new game design and -technology are integrated. Game Studies is an interdisciplinary programme on the cutting edge of information studies, psychology, (new) media and intelligent computer systems.

Staging Science

In the Honours module 'Staging Science', top students are challenged to look at their discipline in a new light. In this course, students learn how they can enhance their creativity by applying a number of stage acting techniques, and to subsequently approach science with an open mind.



'Pushing boundaries means embracing the unknown.' Lucy Wenting, director of IIS

Broad-based research in the natural sciences in Amsterdam

FIGURES

FACULTY OF SCIENCE

Scientific staff



FTEs

Total 996

Male 717

Female 279

Professors 90

Associate professors 68

Assistant professors 100

Postdocs 182

Lecturers and PhD candidates 403

Non-Dutch employees 469

Doctorate conferrals



100

Publications



1,428

The Faculty of Science comprises eight research institutes, each of which has a dedicated field of work. The Faculty thus covers a broad field within the natural sciences.



New in 2015:
Amsterdam Science Magazine



HIGH-LIGHTS

Research institutes at the Faculty of Science participate in five UvA priority areas: Systems Biology, Gravitation, Astro- and Particle Physics, Brain and Cognition, Quantum Matter and Quantum Information, and Sustainable Chemistry. Research conducted within these priority areas highlights the best the UvA has to offer, and enjoy international acclaim. The Faculty itself has designated another four faculty research priority areas in Global Ecology, Green Life Sciences, Informatics for a Data-rich World, and Soft Matter.

10 Veni-, 8 Vidi- and 3 Vici-grants, 5 ERC Starting Grants and 7 Marie Curie Fellowships

Biologist Dr Frank Takken (SILS) and physicists Prof. Florian Schreck (IoP) and Prof. Femius Koenderink (IoP and FOM-institute AMOLF) were awarded a Vici-grant of €1.5 million each by the Netherlands Organisation for Scientific Research (NWO) in January. Another eight researchers from the Faculty of Science received Vidi-grants in May. Each of these researchers receives up to €800,000 for developing an innovative

line of research and establishing their own research group. In July, an additional ten Veni-grants were awarded to researchers who recently obtained their doctorate degrees. These grants amount to a maximum of €250,000 each. The European Research Council (ERC) awarded a Starting Grant to six researchers from the UvA, five of which at the Faculty of Science: Dr Philippe Corboz (IoP), Dr Jean-Michel Désert (API), Dr Floris Roelofsen (ILLC), Dr Ivan Titov (ILLC) and Dr Wouter Waalewijn (IoP). A Starting Grant is a personal grant of about €1,5 million. Seven researchers received a Marie Skłodowska-Curie Fellowship for research projects at the Faculty of Science: Fotini Koutroumpa PhD (IBED), Nicky Wybouw PhD (IBED), Dr Georgios Siviloglou (IoP), Dr Tamara Dobler (ILLC), Dr Marc Galland (SILS), Dr Frank Jacobs (SILS) and Dr Selma de Mink (API). The Fellowship, which amounts to approximately €180,000 for each researcher, is meant to stimulate the international mobility of researchers both within and outside the European Union.

QuSoft: new research centre for quantum software

QuSoft, the first research centre dedicated to quantum software, was officially launched on 3 December. A joint initiative between Centrum Wiskunde & Informatica (CWI), the University of Amsterdam and Vrije Universiteit Amsterdam, QuSoft is located at Amsterdam Science Park and complements the research conducted by the company QuTech, which focuses on the development of quantum hardware.

AAA funding for SOLARDAM, Amsterdam Data Science and Amsterdam Water Science

Three consortia received initial funding from the Amsterdam Academic Alliance (AAA) following a decision by the Executive Boards of VU Amsterdam and the University of Amsterdam. These funds will give them the opportunity to develop a coherent research and degree programme in collaboration with research institutions, government agencies and businesses in the Amsterdam area.

Anton Pannekoek Institute for Astronomy

FIGURES

API

Researchers at Anton Pannekoek Institute for Astronomy (API) search to understand the universe, the objects in it and their history. They test the laws of nature and find new laws.

Staff



FTEs

Professors	3
Associate professors	8
Assistant professors	3
Postdocs	16
PhD candidates	34
Support and management staff	9

Doctorate conferrals



6

Publications



232

Final Kiss of Two Stars in the extreme system VFTS 352 Heading for Catastrophe: discovery by a team of astronomers, including Dr Selma de Mink from API.

Three exceptional objects discovered in nearby galaxy

An international team of scientists, including Dr Jacco Vink of the University of Amsterdam, discovered three exceptional objects in one of the neighbouring galaxies of our Milky Way. They found a superbubble, a pulsar wind nebula and the remnants of a supernova in the Large Magellanic Cloud. The team published their findings on 23 January in *Science*.

Mysterious ripples found racing through planet-forming disc

An international team of astronomers, including UvA professor Carsten Dominik, discovered never-before-seen structures within a dusty disc surrounding a nearby star. The fast-moving wave-like features in the disc of the star AU Microscopii are unlike anything ever observed, or even predicted, until now. The origin and nature of these features present a new

mystery for astronomers to explore. The results were published in the journal *Nature*.

Jason Hessels inducted as new member of The Young Academy

The Young Academy of the Royal Netherlands Academy of Arts and Sciences (KNAW) inducted UvA and ASTRON astrophysicist Dr Jason Hessels as one of ten new members. As a member of The Young Academy, Dr Hessels is part of a dynamic and innovative group of top young scientists with outspoken views on science and scholarship.

Prototype gamma-ray telescope inaugurated

The inauguration of the Gamma-ray Cherenkov Telescope (GCT) prototype on 1 December 2015 was hosted by l'Observatoire de Paris. The GCT will detect very high-energy gamma rays for the world's largest gamma ray observatory, the Cherenkov Telescope Array (CTA). The Anton Pannekoek Institute for Astronomy is one of the major contributors to the development of the camera for the GCT.

Science news

- Dr Joeri van Leeuwen and his international team determined the mass of a neutron star which will lead to a precise understanding of gravity.
- UvA researchers, amongst others, discovered that the infrared fingerprint of PAHs is far more complex than assumed.
- Emeritus professor Ed van den Heuvel explains giant eruption of Eta Carinae by cosmic merger.
- Dr Frank Tramper and colleagues calculated that within the next 1,500 years a huge, extremely hot star in our Milky Way will explode.

Grants and prizes

- Veni-grant for Dr Anne Archibald.
- Vidi-grant for Dr Nathalie Degenaar.
- NSO grant for Prof. Carsten Dominik.
- Marie Curie Re-integration Grant for Dr Selma de Mink.
- TOPC1 grant for Prof. Carsten Dominik.
- ERC Starting Grant for Dr Jean-Michel Désert.
- Horizon 2020 grant for Dr David Berge.
- Dr Nanda Rea wins 2014 IUPAP Young Scientist Prize in Astrophysics.
- TOP C2 for Dr Selma de Mink.
- NWO Instrumentation Grant for Prof. Lex Kaper.

Appointments

- Dr Chryssa Kouveliotou awarded UvA honorary doctorate and inducted to the Royal Netherlands Academy of Arts and Sciences (KNAW).
- Dr Jean-Michel Désert: tenure track in exoplanetary science, also appointed AAA Fellow.
- Dr Antonia Rowlinson: tenure track in Radio Astronomy, jointly with ASTRON.
- Dr Sera Markoff appointed Fellow of American Physical Society.
- Dr Anna Watts elected to Steering Committee for IAU Division D.



'Our universe bubbles with change, our image of it is a movie.'

Prof. Ralph Wijers, director of API

Van 't Hoff Institute for Molecular Sciences

HIMS performs curiosity as well as application driven chemistry research that is internationally competitive, within four research themes: Computational-, Analytical- and Sustainable Chemistry and Molecular Photonics.

FIGURES

HIMS

Staff



FTEs

Professors	14
Associate professors	6
Assistant professors	10
Postdocs	26
PhD candidates	52
Support and management staff	24

Doctorate conferrals



19

Publications



194

HIMS goes for Gold: a new catalyst invented by researchers from HIMS is now being implemented in the precious metals industry by Germany's oldest gold-processing company, Heimerle + Meule. The catalytic process invented at the UvA removes >99.9% of the cyanide from the process wastewater within minutes. The new process is cheaper and more efficient, with a wide spectrum of applications across the metals sector.

HIGH-LIGHTS

Surprisingly complex fingerprint of PAH molecules in space

The Molecular Photonics group studied the molecule naphthalene, a relatively small PAH, using advanced laser spectroscopy under the same conditions as those present in interstellar environments. The acquired spectra appeared to be far more complex than expected. It was concluded that the models that are commonly used deviate strongly from the interstellar reality.

Filling the gap: from alcohols to chiral amines

HIMS researchers reported in *Science* that two enzymes can operate in tandem to convert alcohols to enantiopure amines. The bio-catalytic reaction proceeds with ammonia as the only input and water as the only by-product. This method paves the way for the conversion of inexpensive alcohols derived from biomass to chiral amines that are fundamental intermediates or products for the chemical industry.

Cobalt based catalyst for sustainable conversion

A team of chemists from the Sustainable Chemistry group published in *Science* on cheap and effective catalyst for the production of alcohols that they discovered. The new soluble cobalt based catalyst converts a wide range of esters and carboxylic acids under mild conditions and enables pharmaceutical and fine-chemical industries to increase the sustainability of their conversion technologies.

Self-assembling nanoparticles

Researchers from the Computational Chemistry group discovered that the rotation of nanoparticles such as proteins and colloids plays a key role in self-assembly. This fundamentally new insight provides new opportunities for a better control of the bottom-up synthesis of functional materials. For example, it should be possible to design particles of which the rotation can be controlled with magnetic or electric fields.

NICAS

HIMS joined the Netherlands Institute for Conservation, Art and Science, that was opened on 25 September 2015.

Sustainable Chemistry: Amsterdam meets China

The emeritus lecture of Prof. Aart Kleijn was framed in a seminar on Dutch-Sino collaboration in sustainability.

CASA: Measurements matter

Prior to the inaugural lecture of Prof. Garry Corthals, the UvA-VU Center for Analytical Sciences Amsterdam organised a seminar for researchers from industry and academia.

Grants and prizes

- Prof. Peter Schoenmakers was awarded the Horvath Memorial award, the CASSS award, and he was ranked 7th of the world in the 'Analytical Sciences Power List'.
- Prof. Joost Reek and Prof. Huib Bakker became member of the KNAW.
- 29 project proposals, worth €12 million, with HIMS applicants were granted by EU, NWO, FOM and Topsector Chemistry. 14 projects are in collaboration with and co-financed by companies.
- Prof. Bas de Bruin was elected as the UvA Lecturer of the Year 2015.

Appointments

- Prof. Maarten van Bommel was appointed professor of Conservation Science.
- Dr Tati Fernández-Ibáñez (Organic synthesis) and Dr Francesco Mutti (Biocatalysis) started a tenure track.
- Prof. Jan van Maarseveen was appointed professor of Bio-Inspired Organic Synthesis.
- Prof. Ron Peters was appointed professor by special appointment of Bioterials Analysis.

'2015 was a top year: young scientific staff made a jump start and a record number of new projects were acquired.'

Prof. Joost Reek, director of HIMS



Institute for Biodiversity and Ecosystem Dynamics

IBED aims to increase our understanding of the diversity and dynamics of ecosystems from the molecular and genetic level to entire ecosystems. How do organisms interact with each other and with their non-biological environment?

IBED

FIGURES

Staff



FTEs

Professors	10
Associate professors	10
Assistant professors	19
Postdocs	25
PhD candidates	36
Support and management staff	25

Doctorate conferrals



15

Publications



191

HIGHLIGHTS

Bednets and malaria vaccines not always good combination in fight against malaria

The use of malaria vaccines combined with a bednet can be counter-productive in some cases and can even exacerbate the problem. This follows research carried out by an international team led by Dr Yael Artzy-Randrup from IBED. The results were published online in *PNAS Online Edition*.

Evolution peaks on tropical mountain

Mount Kinabalu in Malaysian Borneo has an exceptionally high biodiversity. Experts, including IBED's Dr Katja Peijnenburg, discovered that most of the unique species that occur in the area have evolved later than the age of the mountain itself, and that some have evolved from immigrant ancestors, whereas others evolved from local ancestors. These findings were published in *Nature*.

Griffon vultures measure the weather

Data generated by GPS tracking devices used in the UvA Bird Tracking System (UvA-BiTS) to study bird behaviour have such a high level of accuracy that they can be used to deduce weather measurements. This was revealed in a study about griffon vultures carried out by IBED. The results of the study were published in the scientific journal *Bulletin of the American Meteorological Society* and as a research highlight in *Nature*.

Orangutan produces human-like sounds

Orangutans have the ability to produce vowel and consonant-like sounds similar to those of human speech. This is the finding of new research conducted by an international team of scientists, amongst them researchers from IBED. The results, published in *PLOS ONE*, offer a new point of departure for studying the evolution of speech.

Science news

- A European science team, including Dr Albert Tietema, showed how active landscape management makes heathlands more susceptible to the effects of climate change.
- Analysis of wastewater from three Dutch main cities by Prof. Pim de Voogt was used in the *EMCDDA European Drug Report 2015*.
- A study by, amongst other international researchers, Dr Stephan Engels, showed that an interruption of the North Atlantic Ocean circulation can abruptly cool off a warm climate in northern Europe.
- Study by Umeå University, Sweden and IBED showed that neither more food nor better food is necessary to increase fish biomass.

Grants and prizes

- Horizon 2020 grant for Dr Daniel Kissling.
- NWO and water companies will study environmental risks during shale gas extraction, Prof. Pim de Voogt and Dr John Parsons lead part of the programme.
- Dr Hans Matthijs and Dr Petra Visser received a grant within the NWO programme License to Operate, for their research to control blue-green algae.
- Dr Boris Jansen takes part in the interdisciplinary project funded by NWO-WOTRO, to strengthen the role of women as food entrepreneurs in the city slums in Africa.
- Dr Daniel Kissling received a grant from the NWO Open Competition programme to study the influence of frugivory on a tropical keystone plant family.
- Prof. Piet Verdonschot en Dr Michiel Kraak received a grant from the Dutch water boards to focus on the innovation of chemical and ecotoxicological water quality assessment.

Appointment

- Bart Nolet was appointed professor by special appointment of Waterfowl Movement Ecology.



'As Einstein said: we still do not know one thousandth of one percent of what nature has revealed to us.'

Prof. Peter de Ruiter, director of IBED

Institute for Logic, Language and Computation



FIGURES

ILLC

	ILLC total		of which Faculty of Science
Staff	FTEs		
Professors	10		4
Associate professors	7		5
Assistant professors	16		6
Postdocs	18		13
PhD candidates	40		25
Support and management staff	5		5
<hr/>			
Doctorate conferrals	5		3
<hr/>			
Publications	249		102

ILLC studies the processes involved in the encoding, transmission and comprehension of information. The concept of 'information' is given a broad interpretation, encompassing not only the characteristics of formal languages and information flows in natural language processing, but also human cognitive activities such as reasoning and listening to music.

ILLC's four Vidi laureates:
 (from left to right) Dr Christian Schaffner, Dr Raquel Fernandez Rovira, Dr Ivan Titov and Dr Floris Roelofsen.

Four Vidi's and three ERC grants

For ILLC, 2015 was an extremely successful year for project grants. In May, the news came that four Vidi-grants of about €1,5 million each were awarded to Dr Raquel Fernández Rovira (Asymmetry in conversation), Dr Floris Roelofsen (Inquisitiveness below and beyond the sentence boundary), Dr Christian Schaffner (Cryptography in the quantum age) and Dr Ivan Titov (Scaling semantic parsing to unrestricted domains). Later in 2015, both Dr Roelofsen (Quantification and Modality in the Realm of Questions) and Dr Titov (Induction of Broad-Coverage Semantic Parsers) also received an ERC Starting Grant of approximately €1,5 million each. Prof. Franz Berto was awarded an ERC Consolidator Grant of circa €2 million for his project *The Logic of Conceivability*. In total, as a result of the grants awarded in 2015, ILLC expects

to welcome 19 new PhD candidates and 14 postdocs, the majority starting up in 2016.

Launch QuSoft

December 3, 2014 witnessed the launch of QuSoft, the first research centre in the Netherlands that is specifically directed to quantum software. QuSoft is a joint initiative of Centrum Wiskunde & Informatica (CWI), VU Amsterdam and UvA. QuSoft is the brain child of CWI-group leader and ILLC professor Harry Buhrman. In 2015, UvA contributed to the funding of QuSoft in the framework of *Quantum Matter and Quantum Information*, a UvA research priority area in which ILLC, IoP and KdVI collaborate.

Theme issue Philosophical Transactions

Why do we have music? And what enables us to perceive, appreciate and make music? Prof. Henkjan Honing was the driving force behind a theme issue of *Philosophical Transactions* of the Royal Society, the world's longest-running scientific journal on the subject of musicality.

Grants and prizes

On top of the four NWO Vidi-grants, two ERC Starting Grants and the ERC Consolidator Grant:

- EU MC Global Fellowship for Dr Sam van Gool.
- EU MC Fellowship for Dr Tamara Dobler.
- Collaboration with Yandex, PhD candidate for Dr Ivan Titov.
- Amazon Web Services grant for Dr Ivan Titov.
- ILLC (Dr Ivan Titov) and Informatics Institute (Prof. Max Welling) collaborate with SAP, 2 PhD candidates.
- NWO Open Competition grant for Prof. Rens Bod (ILLC) and Prof. Jeroen van Dongen (IoP).
- Horizon 2020 EU grant for Prof. Khalil Sima'an.
- AAA UvA-VU Data Science programme awarded a total of €3 million. Within this project, Prof. Rens Bod amongst others, is awarded funding for a sub-project on Deep Data.
- Lotze Medal 2015 awarded to Dr Sonja Smets.

Appointments

- Prof. Johan van Benthem was elected Foreign Honorary Member of the American Academy.
- Prof. Dick de Jongh was awarded honorary doctorate at Ivane Javakishvili Tbilisi State University, Georgia.



'One of my highlights in 2015 was to hear students sing *It's fun to work at the I-L-L-C* at a party.'

Prof. Yde Venema, director of ILLC

Institute of Physics

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

ALBERT EINSTEIN (1879-1955)

With a substantial fraction of its research activities embedded within three research priority areas, the Institute of Physics covers a broad spectrum of both experimental and theoretical topics ranging from particle physics to soft matter.

FIGURES

IoP

Staff



FTEs

Professors	21
Associate professors	12
Assistant professors	13
Postdocs	36
PhD candidates	105
Support and management staff	10

Doctorate conferrals



25

Publications



261



Graffiti of Einstein's Gravity equation on the wall of Museum Boerhaave in Leiden, unveiled on 24 November 2015 by Prof. Robbert Dijkgraaf. IoP's staff member Ivo van Vulpen, together with Sense Jan van der Molen (Leiden), took the initiative.

HIGHLIGHTS

Snellius Medal awarded to Dutch ATLAS Group

The Society for the Advancement of Science, Medicine and Surgery awarded the 2015 Snellius Medal to the Dutch ATLAS Group. The ATLAS researchers received the medal, awarded once every decade, for their contribution to the research that led to the discovery of the Higgs Boson. Prof. Stan Bentvelsen received the medal on behalf of the whole group on 21 November during the Lustrum Symposium in honour of the Society's 225 anniversary.

New research centre for quantum software QuSoft launched

QuSoft, the first research centre dedicated to quantum software, was launched on 3 December. A joint initiative between the University of Amsterdam, Centrum Wiskunde & Informatica (CWI), and Vrije Universiteit Amsterdam, QuSoft

is located at Amsterdam Science Park. It complements the research conducted by QuTech, which focuses on the development of quantum hardware. In addition to investments by CWI and VU Amsterdam, QuSoft receives structural funding through UvA's Quantum Matter and Quantum Information (QM&QI) research priority area, coordinated by IoP.

NWO Vici-grant for Florian Schreck

Prof. Florian Schreck, professor of Experimental Quantum Physics, received a prestigious Vici-grant from NWO. He will use the grant to build an eternal atom laser, based on the quality that atoms aren't merely particles but also waves. He will then use this laser to construct the ultimate clock: an optic laser with unheard of stability.



'Physics in Amsterdam is thriving: two new research centres, QuSoft and NICAS, were launched in 2015.'

Prof. Daniel Bonn, director of IoP

Grants and prizes

- STW grant for Prof. Tom Gregorkiewicz and Prof. Wim Sinke in the Open Technology programme, for using hot carriers to harvest energy of the entire solar spectrum.
- FOM Industrial Partnership programme, with Prof. Daniel Bonn and Prof. Peter Schall, investigates physical behaviour of everyday products.
- Prof. Patrick Decowski amongst five awardees of 2016 Breakthrough Prizes in Fundamental Physics.
- Royal decoration for Prof. Wim Sinke for his exceptional contribution to society as a director of R&D in the field of sustainable energy.
- FOM 'Projectspace' grants for Prof. Eric Laenen and Dr Marcel Vreeswijk (jointly) and Dr Katerina Dohnalová.

Appointments

- Prof. Jan de Boer was appointed as member of FOM's Executive Board.
- The Astroparticle Physics European Consortium (APPEC) appointed Prof. Frank Linde as its new chair.
- Professorial appointments for Prof. Peter Schall, Prof. Joost Frenken (ARCNL) and Prof. Patrick Decowski.

Science News

- Dr Gianfranco Bertone and colleagues found first proof of dark matter in innermost region of Milky Way. Published in *Nature Physics*.
- A team of physicists, including Dr Jasper van Wezel, identified the way in which electrons form crystals within crystals (two articles in the journal *Nature Communications*).
- The international XENON collaboration, including Prof. Patrick Decowski and colleagues, inaugurated the new XENON1T experiment, underground in Italy. It will search for dark matter.

Informatics Institute

FIGURES

Staff



FTEs

Professors	10
Associate professors	8
Assistant professors	12
Postdocs	27
PhD candidates	63
Support and management staff	22

Doctorate conferrals



12

Publications



191



The Informatics Institute conducts fundamental and applied research in the field of computer science, focusing on complex information systems, and with an emphasis on collaborative, data-driven, computational and intelligent systems with interactive components.

HIGHLIGHTS

ERC Starting Grant for Joris Mooij

Dr Joris Mooij, researcher in the AMLab, obtained an ERC Starting Grant for the project 'Causal Analysis of Feedback Systems (CAFES)', to enable large-scale applications of causal inference in various challenging domains in science, industry and decision making. The work will be conducted with a strong focus on applications in molecular biology, one of the most promising areas for automated causal inference from data.

New algorithm for tracking changes in word usage and comparing the meanings of sentences

Tom Kenter MSc has developed an algorithm that enables computers and search engines to work out whether two sentences mean the same thing. He also developed a method to automatically track changes in word usage. Together

with Humanities scholars from the University of Amsterdam and Utrecht University, he developed an algorithm to track changes in word usage over time. The results of both studies were presented at the Conference on Information and Knowledge Management 2015 in Melbourne, Australia.

Dr Guido van 't Noordende launched the Whitebox pilot project

The Whitebox is an alternative to the National Coordination Point, designed to facilitate the secure communication of medical data. The Whitebox was developed in close cooperation with general practitioners and in response to a demand from both care providers and patients seeking to exchange medical data in specific situations. Data can be exchanged efficiently without any need to make information accessible to a large number of care providers.

Valorisation

- Qualcomm and UvA jointly started research lab QUVA Lab. It will investigate machine learning techniques for processing sensory data, including image recognition on mobile and embedded systems.
- Spin-off Scyfer received FICHe funding of €217,000 for bringing its self-learning data platform for the analysis of medical imaging to the market.
- Amirhossein Habibian MSc, Dr Thomas Mensink and Dr Cees Snoek received a COMMIT7 valorisation grant for their project VideoStoryXL.

Grants and prizes

- Prof. Maarten de Rijke obtained an NWO grant within the Creative Industries programme.
- NWO grant for Prof. Peter Sloot and Dr Mike Lees for 'The Kumbh Mela Experiment'.
- STW project awarded to Dr Raphael Poss and Prof. Andy Pimentel to improve the monitoring inside -and management of- large, complex computer systems.
- Horizon 2020 funding for Prof. Alfons Hoekstra in FET High Performance Computing Call.
- Horizon 2020 grant for Dr Zhiming Zhao and a Horizon 2020 funding for the project VRE4EIC.
- Horizon 2020 grant for Dr Leo Dorst in the international ABRACADABRA project.
- Horizon 2020 funding for Prof. Dariu Gavrilă for the PROSPECT project.
- Horizon 2020 funding for Dr Yuri Demchenko for his project EDISON.
- Horizon 2020 project for Dr Ana Lucia Varbanescu as partner in the European project EXTRA.
- Horizon 2020 grant for Prof. Theo Gevers for research involving an outdoor garden trimming robot.
- Emeritus professor Paul Klint awarded the 2015 IEEE's TCSE Software Engineering Distinguished Service Award.

'Our research in informatics is applied more than ever before. We are even transitioning from a technology push to a market pull.'

Prof. Jan Bergstra, director of IWI

Korteweg-de Vries Institute for Mathematics

FIGURES

KdVI

The Korteweg-de Vries institute advances the science of mathematics, both in its theoretical and applied aspects, and aims to stimulate the application and appreciation of mathematics in other academic disciplines and in society as a whole.

Staff



FTEs

Professors	11
Associate professors	8
Assistant professors	8
Postdocs	10
PhD candidates	25
Support and management staff	3

Doctorate conferrals



7

Publications



88

HIGHLIGHTS

Miranda Cheng in the spotlight with Umbral Moonshine theory

In 2015, Dr Miranda Cheng (KdVI and IoP) got a lot of attention with her Umbral Moonshine theory. The word moonshine, when used in mathematics, refers to an unexpected relation between two very different mathematical structures. Cheng and co-workers discovered a new and fascinating moonshine relation, named umbral moonshine. Her discovery led to an ERC Grant, an interview in the newspaper *NRC*, an article in the French newspaper *Le Monde* and a guest lecture at the European Women in Mathematics meeting. With the grant, Dr Cheng will be able to further explore the mysterious ‘moonshine relation’ in the context of string theory.

Michel Mandjes guest editor for *Nieuw Archief voor Wiskunde*

In 2015 Prof. Michel Mandjes was asked to be a guest editor for the September edition of *Nieuw Archief voor Wiskunde*, together with Prof. Johan van Leeuwen (TU/e). This magazine is read by a broad audience of mathematicians. The September edition was dedicated to the theme ‘Netwerken’ in light of the NETWORKS programme, of which Mandjes is project leader. The edition covered a broad range of topics dealing with stochastic and algorithmic aspects of networks.

Lex Schrijver receives EURO Gold Medal 2015

Prof. Lex Schrijver was awarded the EURO Gold Medal 2015. The award was presented at the opening session of the EURO 2015 Conference on Operational Research in Glasgow (Scotland). The EURO Gold Medal is the highest distinction within Operational Research in Europe.

IN BRIEF

Science news

In December the research centre QuSoft, in which the groups of Prof. Eric Opdam and Prof. Jasper Stokman are involved, was launched.

Grants and prizes

- NWO Veni-grant for Dr Guus Regts and Dr Sonja Cox.
- Nanang Susyanto MSc was awarded Best Student Paper during the WIC Symposium in Brussels.
- Dr Botond Szabó received the Willem R. van Zwet Award for his thesis.

Appointments

- Prof. Eric Opdam was appointed director of the institute; he succeeds Prof. Jan Wiegerinck, who was the director for ten years.
- Dr Arno Kret was appointed assistant professor in the Algebra, Geometry and Mathematical Physics programme.
- Dr Asma Khedher was appointed assistant professor in Financial Mathematics.
- Dr Viresh Patel was appointed assistant professor in Discrete Mathematics.
- Six postdocs and six PhD students joined the institute.



‘I’m proud of all the young talented researchers who found their way to our institute.’ Prof. Eric Opdam, director of KdVI

Swammerdam Institute for Life Sciences

FIGURES

Staff



FTEs

Professors	17
Associate professors	10
Assistant professors	29
Postdocs	33
PhD candidates	91
Support and management staff	55

Doctorate conferrals



13

Publications



171

SILS

Research at SILS spans the biological processes that take place in humans, animals, plants and micro-organisms, and plays a key part in the exchange of information and extension of research across disciplinary boundaries.

Customised cultivation of *Synechocystis* PCC6803 and derivatives.

Vici-grant for Frank Takken

Dr Frank Takken, assistant professor of Molecular Plant Pathology, was awarded a prestigious Vici-grant. He will use this grant to study the molecular basis of the plant immune system, in particular the role of immune receptors.

Microscopy centre NKI, UvA and AMC among best in Europe

The Van Leeuwenhoek Centre for Advanced Microscopy (LCAM), a collaboration of the Netherlands Cancer Institute, AMC-UvA and UvA's Faculty of Science, is one of the leading microscopy centres in Europe according to Euro-BioImaging and has therefore been officially endorsed as a node of this European consortium.

New book by Prof. Cyriel Pennartz explains sensory qualities in terms of cognitive processes

In his book *The Brain's Representational Power – On Consciousness and the Integration of Modalities* neuroscientist Prof. Cyriel Pennartz investigates how the sensory qualities we consciously experience can be explained in terms of cognitive processes.

Understanding the effects of salt on plants

In a review published in the journal *Trends in Plant Science*, Dr Christa Testerink and Dr Magdalena Julkowska summarise the current body of knowledge on the effects of salt stress on plants on various time scales and in various organs. The article was featured on the cover and accompanied by a video abstract online.

Science news

- Prof. Leendert Hamoen and his Bacterial Cell Biology team discovered that bacterial chemoreceptors localise at the cell poles due to their curved shape. Published in *Nature Communications*.
- Prof. Cyriel Pennartz and Jorrit Montijn MSc, discovered an important pattern in the brain mechanism that allows for the conscious perception of visual objects (eLife).

Grants and prizes

- Dr Harrold van den Burg en Prof. Marcel Prins received funding for the research project 'Resistance to a destructive plant virus' by the Topsector programme Horticulture and Starting Materials to screen for novel disease resistance.
- Dr Aniko Korosi received the NWO Food & Cognition grant in collaboration with Danone research to study the effects of early nutrition on brain development.
- Dr Frank Takken and Dr Martijn Rep, together with five partner organisations, were awarded a Marie Curie Action programme for the research project BestPass that studies the molecular mechanisms of crop-endophyte interactions to improve sustainability and plant productivity.
- Dr Umberto Olcese and PhD student Conrado Bosman Vittini will investigate how different sensory areas of the cerebral cortex communicate. They were awarded a three-year grant by the FLAG-ERA Joint Transnational Call Initiative 2015.
- Giulia De Luca MSc won the Upcoming Scientist Award at Innovation for Health 2015.

Appointments

- Leendert Hamoen was appointed professor of General Microbiology.
- Marten Smidt, professor of Molecular Neuroscience, was appointed director of SILS.



'SILS has intensified collaborations with our VU partners and continues to invest in ground-breaking research in all sections of the life sciences.' Prof. Marten Smidt, director of SILS

Society and the Faculty of Science



Chemist Dr Sander Kluwer demonstrates how fireworks work, during one of the monthly lectures for children in science center NEMO.

Science and scientists of the Faculty reached out to large audiences in 2015, through media and through activities aimed at the general public.

The general public: science communication

Harry Buhrman, Ralph Wijers and Sebastiaan de Vet each gave a week-long class at the *Universiteit van Nederland*, Jan van Maarseveen demonstrated how your body converts glucose into energy in the TV show *Proefkonijnen* (Guinea pigs) and Master's student Camilla Dreef reached the semi-finals of the game show *In de ban van de Condor* (Under the spell of the Condor) as a bird expert.

The Faculty opened the doors to wide audiences. In October, the annual Science Park Open Day took place. And throughout the year, guests were able to get acquainted with the work of Faculty of Science researchers during the 'college tour' events at the academic-cultural centre Spui 25.

Valorisation of research

Though already very active in valorisation, since 2015 the Faculty of Science has more prominently publicised both its plans and achievements in respect to valorisation. This was not only in response to the Executive Board's new valorisation criteria, but was also prompted by external research sponsors, who increasingly require a valorisation plan to form an integral part of a research proposal. 2015 saw the submission of five new patent applications and the

establishment of two spin-offs (Quantis dot and Plantics). These small companies were set up by faculty staff using knowledge acquired in their research. IXA and ACE Venturelab (and thus UvA Holding B.V.) specialise in supporting new entrepreneurs, a service that the faculty is making ample use of. In 2015, a partnership was entered into with U.S. company Qualcomm for a minimum of five years. The key research areas in the QUVA Lab are image recognition and deep learning.

This partnership resulted from Qualcomm's 2014 acquisition of EUvision, a UvA spin-off.

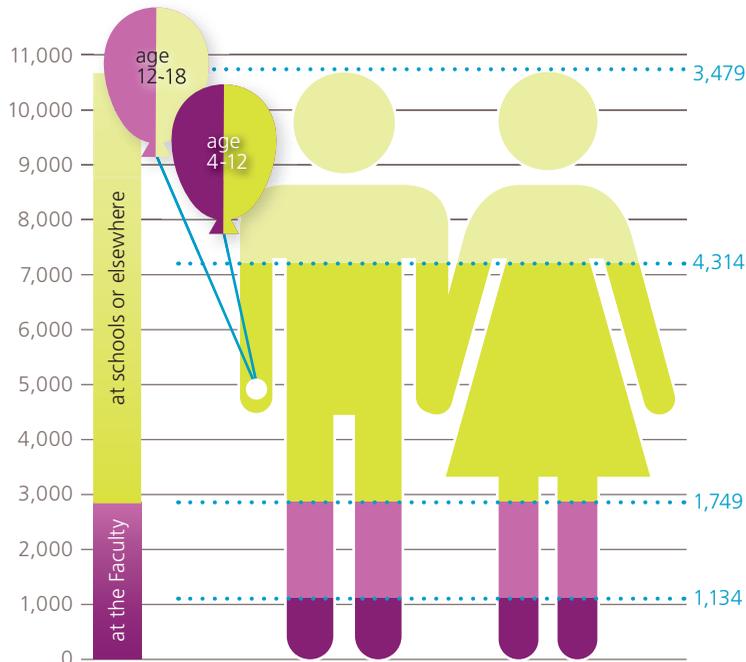
Future scientists

To give a better idea of the research done at the Faculty of Science, the Outreach department develops activities for school children and their teachers. The general aim is to get children interested in science and to challenge them to think about science in the world around them.

OUTREACH 2014-2015

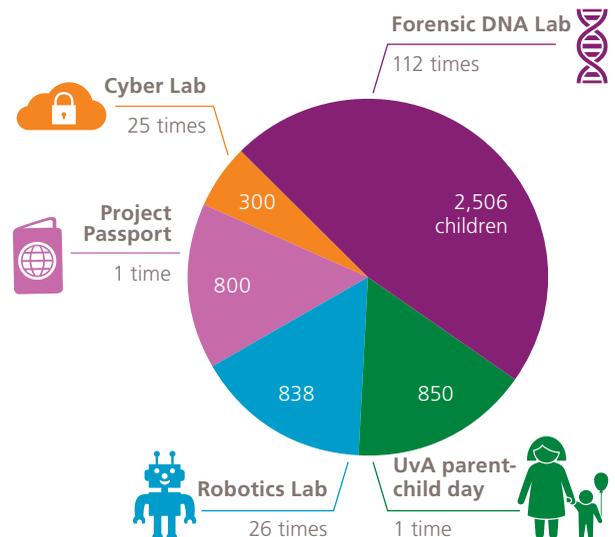
CHILDREN REACHED

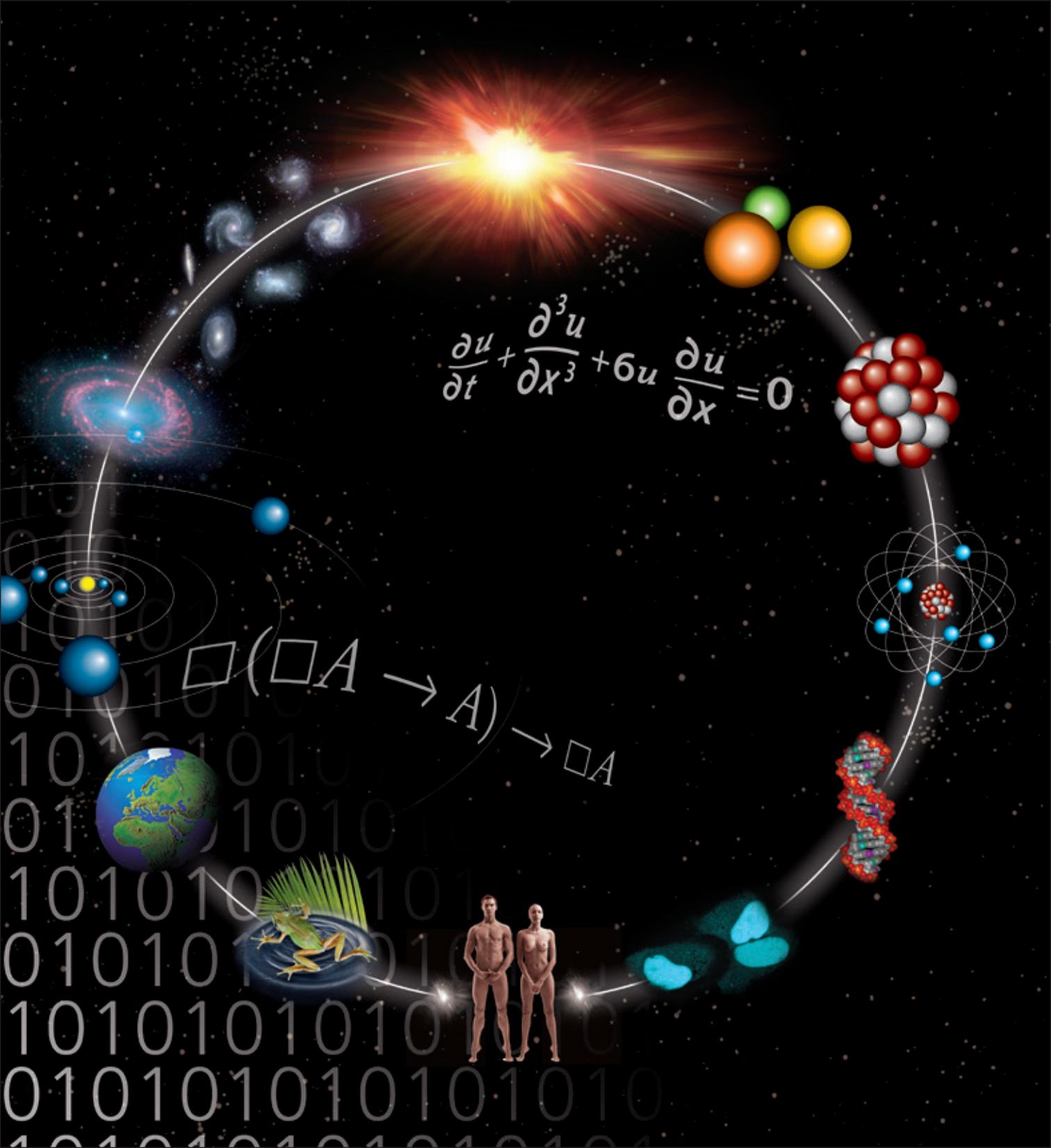
10,676 in total



TOP 5 ACTIVITIES

285 activities in total





$$\frac{\partial u}{\partial t} + \frac{\partial^3 u}{\partial x^3} + 6u \frac{\partial u}{\partial x} = 0$$

$$\square(\square A \rightarrow A) \rightarrow \square A$$

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